

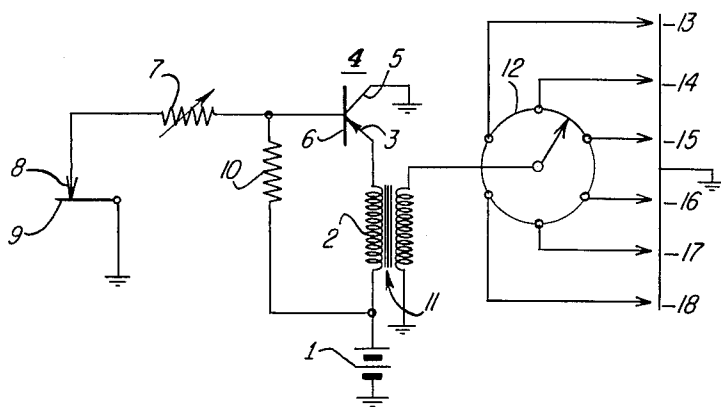
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R. T. RACE

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TRANSISTOR CIRCUIT

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INVENTOR.

Richard T. Race

BY *Mueller & Aichele*

Attys.

1

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TRANSISTOR CIRCUIT

Richard T. Race, Chicago, Ill., assignor to Motorola, Inc., Chicago, Ill., a corporation of Illinois

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1 Claim. (Cl. 321—45)

This invention relates to ignition systems for internal combustion engines and more particularly to such systems utilizing a transistor as an isolating element to protect the breaker points.

In conventional ignition systems, a relatively large current is passed through a spark coil and interrupted by circuit interrupting breaker points, thereby causing a large voltage to be developed across the spark coil and transmitted to the spark plugs. The voltage developed equals

$$L \frac{dI}{dt}$$

where L is the inductance, and I is the current.

One of the most frequent causes of trouble in conventional ignition systems, for instance, of automobile engines, is caused by pitting, carbonizing and wear of the contacts of the breaker points due to the high voltage and current being interrupted, which causes poor contact and eventual failure of the system. Automobile users are normally required to replace the breaker points several times during the useful life of the automobile, even though condensers are generally connected in parallel with the breaker points, to reduce arcing.

Accordingly, an object of the present invention is to provide a new and improved ignition system for internal combustion engines.

A further object of the invention is to provide an interrupter type ignition system in which the life of the breaker points is greatly increased.

Another object of the invention is to provide a new and improved ignition system having means to isolate the breaker points from the large spark coil current, and voltage.

A feature of the invention is the provision of a new and improved ignition system including a transistor which isolates the large spark coil current and voltage from the breaker points.

Another feature of the invention is the provision of an interrupter type ignition system having a transistor, with a control circuit through the circuit interrupting means controlling the transistor to provide current flow in primary circuit through the spark coil.

These and other objects and features of the invention will be apparent from the following specification when taken with the accompanying drawing; the single figure of which shows the ignition system in accordance with the invention.

The invention generally comprises a source of voltage, a spark coil and breaker points which are all standard, with a transistor connected between the coil, the points and ground. The base of the transistor is connected in series with the breaker points providing a control current path. One electrode of the transistor is grounded and another is connected to the coil thereby providing a primary high current path through the coil. Suitable biasing and current adjusting means are provided.

Referring now to the drawing, the ignition system of the present invention comprises a source of voltage 1

2

connected to ground at one end, and having the other end connected to spark coil 2. The spark coil 2 is connected at its other end to the emitter 3 of transistor 4. The collector 5 of the transistor is connected to circuit ground.

By ground is meant a common reference potential of the circuit. The base 6 of the transistor is connected to a variable resistor 7 which is connected to the breaker point 8. The other contact 9 of the breaker point means is connected to ground. A bias resistor 10 is connected between the junction of the voltage source 1 and the spark coil 2, and the base 6 of the transistor. The spark coil is coupled by means of a transformer 11, to the distributor 12 which connects to the spark plugs 13-18 inclusive.

In operation, when the breaker points 8, 9 are closed by a mechanical connection to the engine crankshaft, not shown, there will be a relatively small current from the voltage source through the coil emitter 3, base 6, variable resistor or potentiometer 7, and breaker points 8, 9 to ground. This will produce a relatively large current from the voltage source through the coil emitter 3, base 6, the voltage source 1 through the coil 2, emitter 3 and collector 5 to ground.

Grounded collector transistor circuits are uniquely suited for this application since they are characterized by high input resistance and low output resistance. In this particular circuit the transistor presents a high resistance in series with breaker point circuit, and a low resistance from the spark coil to ground.

In one embodiment of this system, utilizing a 12 volt battery as a voltage source, a Motorola type 2N14 transistor and a 10 ohm bias resistor, when the breaker point is closed about 10 milliamperes flows through the breaker points. With this bias condition about 4 amperes of collector-emitter current flows through the spark coil. When the breaker is opened, the transistor base, i.e. control, current drops to essentially zero and the primary collector emitter current falls to a level of about 2 milliamperes or less. This results in a collapse of the magnetic field in the spark coil thereby producing a spark which is applied to the spark plugs. In the embodiment above described the resistor 7 had a value from 0 to 100 ohms. It is used for adjusting the bias on the transistor and current through the point contacts 8, 9. Assuming the potentiometer was set at 90 ohms, approximately 120 mils of bias current would flow through the bias resistor 10 and the potentiometer 7, generating a bias of 1.2 volts, across resistor 10 between the base and the emitter of the transistor. The current and voltage waveforms are a series of damped oscillations so that their average values are small.

Therefore, it is seen that the present invention provides an ignition system utilizing a transistor to isolate the breaker points from the large spark coil current. Only a small control current flows through the circuit interrupting breaker points which will reduce contact troubles to a degree that breaker points may be expected to last the life of the automobile.

I claim:

In an ignition system for an internal combustion engine having breaker points adapted to be opened and closed by operation of the engine, the combination including a power supply conductor and a reference conductor adapted to be energized by a low voltage potential source associated with the engine, a spark coil having first and second winding portions, a transistor having emitter, collector and base electrodes, means directly coupling said collector electrode to said reference conductor, circuit means coupling said power supply conductor and said first winding portion and said emitter electrode in series in a direct current path so that current from the potential source may be conducted therethrough for storage of energy in the said first winding portion, a current

3

limiting bias resistor direct current coupling said breaker points between said base electrode and said reference conductor and a bias and damping resistor direct current coupling said base electrode to said power supply conductor for biasing said transistor into heavy conduction and into substantially non-conduction as said breaker points are closed and opened respectively, whereby decrease in conduction of said transistor causes a voltage to be induced in said second winding portion of said spark coil for utilization in the ignition system of the engine.

5

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4

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